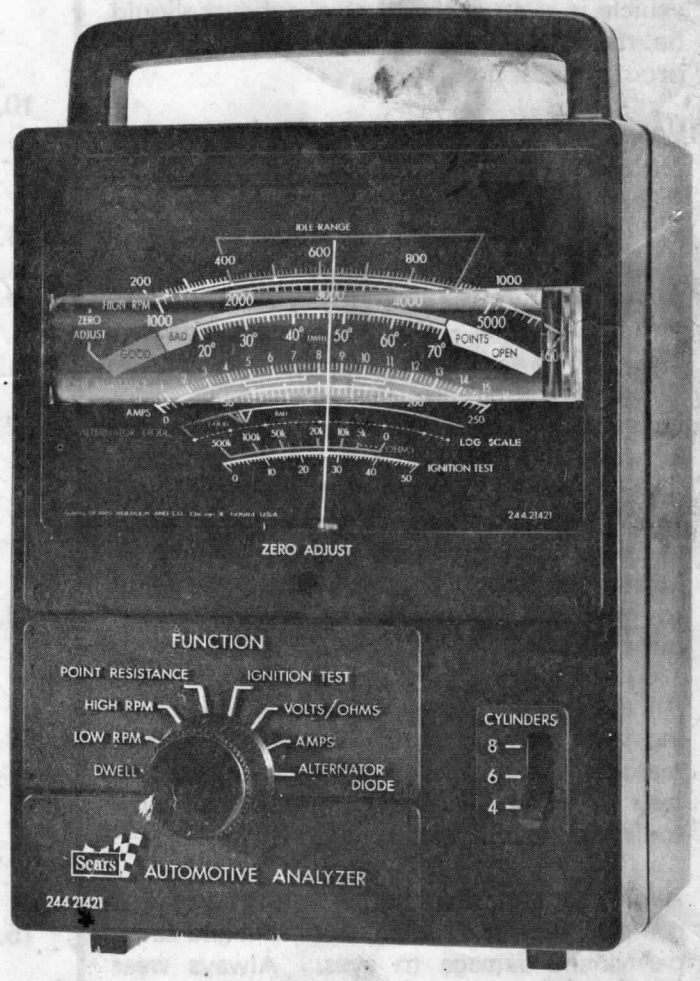
Sears

owner's manual

AUTOMOTIVE ANALYZER

MODEL NO.
244.21421



- **INTRODUCTION**
- **OPERATION**

SEARS, ROEBUCK AND CO. U.S.A.
CHICAGO, ILLINOIS 60684

3-0458-6

PRINTED IN U.

— RULES FOR SAFE AUTOMOTIVE TESTING —

READ CAREFULLY
BEFORE USING TEST EQUIPMENT

1. Read test equipment instructions and Rules For Safe Automotive Testing carefully. Failure to follow instructions and safety rules could result in serious bodily injury and/or damage to the instrument.

2. Before starting engine, set parking brake and place gear selector in neutral (standard transmission) or Park (automatic transmission).

3. The carbon monoxide in exhaust gas is highly poisonous. To avoid asphyxiation, always operate vehicle in a well-ventilated area. If vehicle is in an enclosed area, exhaust should be routed directly to the outside via leakproof exhaust hose.

4. When using a timing light in a garage or other enclosed area, keep timing light at least 18 inches above the floor to minimize the possibility of igniting gasoline vapors.

5. Never puncture the ignition wires to hook-up test equipment. Use the proper adapter.

6. When operating any test instrument from an auxiliary battery, connect a jumper wire between the negative terminal of the auxiliary battery and ground on the vehicle under test. When working in a garage or other enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting gasoline vapors.

7. An automobile battery is capable of producing very high currents. Therefore, exercise reasonable care when working near the battery to avoid electrical connections through tools, wristwatch, etc.

8. Avoid contact with battery electrolyte. It can eat holes in clothing, burn skin and cause permanent damage to eyes. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek medical aid.

9. The gases generated by a charging battery are highly explosive. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Any room or compartment containing charging batteries should be well-ventilated to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is charging, and always turn charger off before disconnecting. Turn automotive test equipment off when connecting or removing battery clips. When removing or reconnecting battery cables, make sure ignition switch and all accessories are turned off.

10. Never add acid to a battery once the battery has been placed in service. Doing so may result in dangerous spattering of electrolyte.

11. Keep hands, hair, necktie, loose clothing and test leads well away from fan blade, fan belt, power steering belt, air conditioner belt and other moving engine parts, as serious injury could result from entanglement.

12. Do not touch hot exhaust manifold, radiator or high-voltage spark plug and coil terminals. While spark voltages are not normally lethal, an involuntary jerk of the hands caused by electrical shock may result in injury.

13. Never look directly into carburetor throat while engine is cranking or running. A sudden backfire can cause serious burns.

14. To avoid the possibility of a flash fire, do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump or other potential sources of spilled gasoline or gasoline vapors.

15. Never remove radiator cap while engine is hot. Hot coolant escaping under pressure can cause serious burns.

16. Jack supplied with vehicle should be used only for changing wheels. Never crawl under car or run engine while vehicle is on jack.

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INTRODUCTION

GENERAL INFORMATION

The Model 244.21421 Automotive Analyzer is designed for testing overall engine performance of automobiles, trucks, buses, boats, tractors and other engine driven machinery. Although a sensitive electronic instrument, it should provide years of maintenance-free performance with reasonable care in usage and handling.

The instrument can be connected to all conventional and transistorized ignition systems, regardless of voltage or battery ground. The unit will also work on 2, 3 and 4-rotor rotary engines, as well as conventional piston engines. (See publication No. 3-1054-6 for information on testing the 1973 Mazda RX-2 and RX-3 rotary engine.)

The meter face consists of ten direct reading scales: 200-1000 RPM; 1000-6000 RPM; Good/Bad/Open Point Resistance Band; 20°-70° Ignition Point Dwell Angle; 0-16 Volts; 0-250 Amps; Good/Bad Alternator Diode Scale; Log Scale; 0-500,000 Ohms; and 0-50 Ignition Test Scale. A special magnifying bar simplifies reading of all scales. Simply slide the magnifier up or down on the meter front to highlight the scale in use.

The meter is also equipped with an adjustment screw that allows mechanical adjustment of the meter needle. When necessary, rotate the screw on the meter front with a small screwdriver until the meter needle is at the Zero Adjust mark on the left edge of the Point Resistance band.

DWELL / TIMING RELATIONSHIP

There is a direct relationship between dwell and timing. However, it is only a one-way relationship. If you change the dwell angle of the breaker points, you will automatically change the timing of the ignition. Changing the timing, though, has no effect on the dwell angle. For this reason, it is important to recheck the timing whenever the dwell angle has been adjusted.

When the dwell angle is increased, the timing is retarded. Conversely, when the dwell angle is decreased, the timing is advanced. In fact, there is a one-to-one ratio between dwell and timing; for every one degree change in dwell, there is a corresponding one degree change in timing. If, for example, you wish to advance the timing two degrees, it can be done by reducing the dwell angle two degrees. Of course, in making such adjustments, the dwell angle should not be moved out of its specified range.

Due to wear of the rubbing block, the normal tendency is for the dwell angle to increase. This causes the timing to become retarded and results in a loss of power and economy. If the engine was properly tuned initially, restoring the dwell angle to its original setting will restore the timing to its original setting.

MANUFACTURERS' SPECIFICATIONS

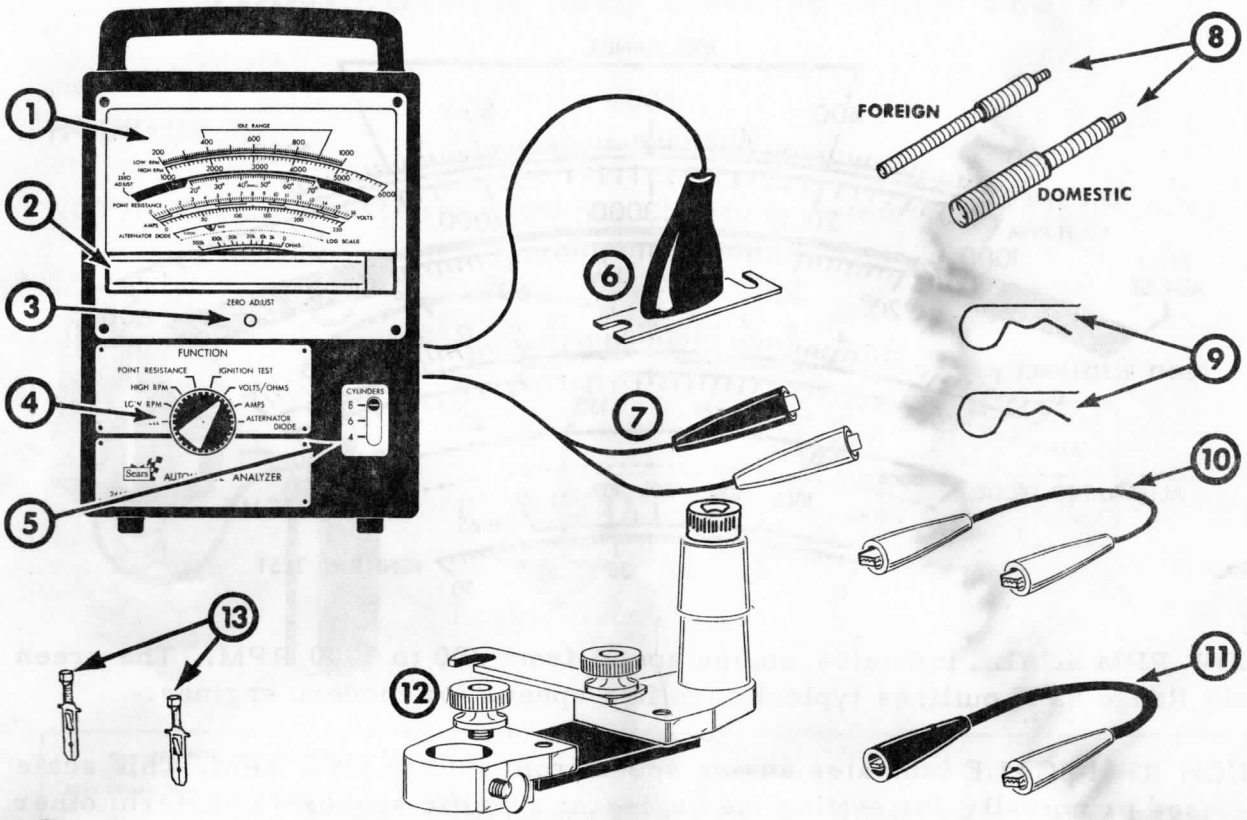
In performing the AUTOMOTIVE ANALYZER tests described in this manual, it is important to follow manufacturer's specifications for the test vehicle whenever possible. These specifications can be found in the vehicle manufacturer's service manual or in any of the following publications:

1. National Service Data Book
   National Automotive Service, Inc.
   Div. Glenn Mitchell Manuals, Inc.
   Box 10465, San Diego, Calif. 92110

2. Chilton's Auto Repair Manual
   Chilton Company
   56th and Chestnut Streets
   Philadelphia, Pennsylvania 19139

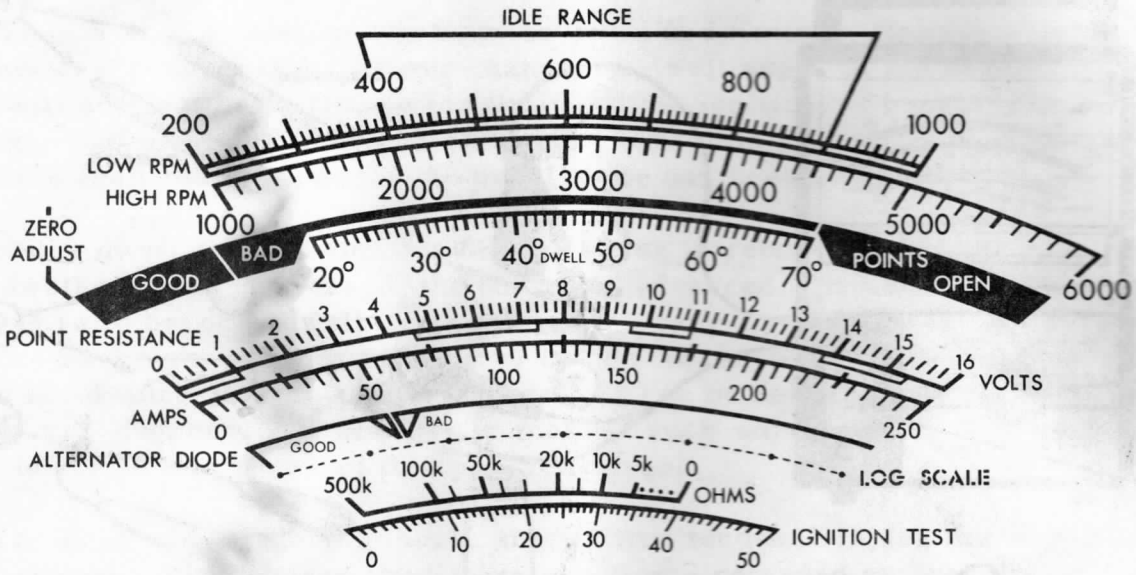
3. Motor's Auto Repair Manual
   250 West 55th Street
   New York, New York 10019

CONTROLS, LEADS AND ACCESSORIES



1. METER FACE provides readout of test results on ten color-coded scales. See page 4 for description of individual scales.
2. MAGNIFYING BAR slides up and down on the meter face to provide approximately 1 1/3X magnification of the meter scale in use.
3. ZERO ADJUST SCREW is rotated with a small screwdriver to bring meter pointer to exact zero (Zero Adjust Mark) prior to testing.
4. FUNCTION SELECTOR SWITCH has eight positions which correspond to the different testing functions performed by the AUTOMOTIVE ANALYZER.
5. CYLINDERS SWITCH is set to 4, 6 or 8 cylinder position to correspond with the number of cylinders in the engine under test. Correct setting of this switch is required for Dwell and Engine Speed tests.
6. AMMETER SHUNT is used with Battery Post Adapter to take ammeter readings.
7. RED & BLACK TEST CLIPS are connected as shown under individual test hook-ups.
8. DOMESTIC AND FOREIGN SPARK PLUG ADAPTERS facilitate Ignition Test hook-up on domestic and foreign vehicles.
9. PRIMARY CIRCUIT COIL ADAPTERS provide easier hook-up to vehicles with covered or hard-to-reach coil primary terminals.
10. JUMPER WIRE, identified by red boot at each end, is used in various tests to ground vehicle ignition or to extend reach of Test Clips.
11. TACH ADAPTER (4-6342-0) is used in conjunction with Test Clips to provide accurate tachometer readings on General Motors High Energy Ignition and American Motors Breakerless Inductive Discharge Ignition.
12. BATTERY POST ADAPTER connects between negative battery post and negative battery cable for use in several Electrical System Tests.
13. SPADE ADAPTERS facilitate hook-up to the 1976 Chevette Electrical Diagnostic connector.

METER SCALES



LOW RPM SCALE indicates engine speed from 200 to 1000 RPM. The green Idle Range band outlines typical curb idle speeds for modern engines.

HIGH RPM SCALE indicates engine speed from 1000 to 6000 RPM. This scale is used principally for setting the engine at specific speeds to perform other tests.

ZERO ADJUST MARK is used to preset the meter pointer to exact zero. When necessary, rotate the screw on the meter front to align the pointer with the Zero Adjust Mark.

POINT RESISTANCE SCALE shows ignition contact point condition on color-coded Good, Bad and Points Open bands.

DWELL SCALE provides readout of contact point dwell angle from 20° to 70°.

VOLTS SCALE indicates voltage from 0 to 16 volts in various automotive circuits.

AMPS SCALE measures direct current from 0 to 250 amperes.

ALTERNATOR DIODE SCALE uses color-coded Good and Bad bands to show condition of alternator diodes and stator windings.

LOG SCALE provides a standard point of reference for comparing readings on other scales. Comparative scale readings can be temporarily recorded by marking the meter face with a grease pencil.

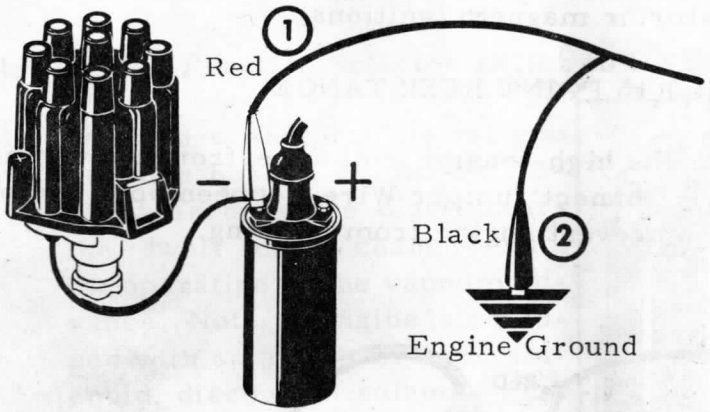
OHMS SCALE measures from 0 to 500K (500,000) ohms of resistance in automotive electrical components.

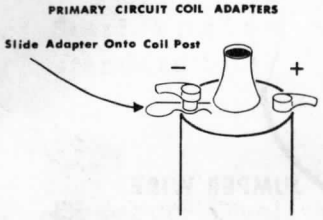
IGNITION TEST SCALE measures relative efficiency of secondary ignition circuits.

POINTS, DWELL AND ENGINE SPEED TESTS

HOOK-UP

NOTE: For hook-up to transistorized ignition systems, see pages 29-30.





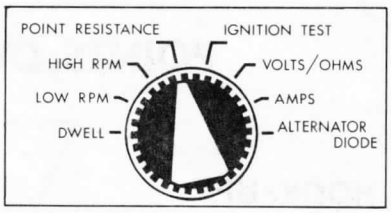
Primary Circuit Coil Adapters provide easier connection to vehicles with covered or hard-to-reach coil primary terminals.

1. Connect Red clip to the distributor (negative) terminal of the ignition coil.

2. Connect Black clip to a good ground on the engine.

3. Set the Cylinders switch to 4, 6 or 8, according to the number of cylinders in the vehicle to be tested. (If engine has 1 or 2 cylinders, place Cylinders switch in the 4 position; if engine has 3 cylinders, place Cylinders switch in the 6 position.)

NOTE:
Reverse test leads for positive ground vehicles.



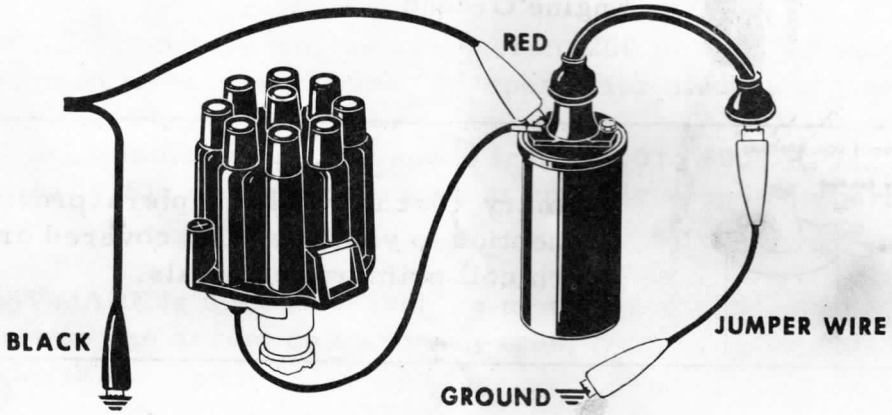
POINT RESISTANCE TEST

(Connect Red and Black test clips as shown on page 5.)

NOTE: This test applies only to breaker-point-type battery ignition systems (does not apply to transistor or magneto ignitions).

1. Rotate Function Selector switch to POINT RESISTANCE.

2. With engine stopped, remove the high-tension coil wire from the center tower of the distributor cap. Connect Jumper Wire between open end of coil wire and a good ground to prevent engine from starting.

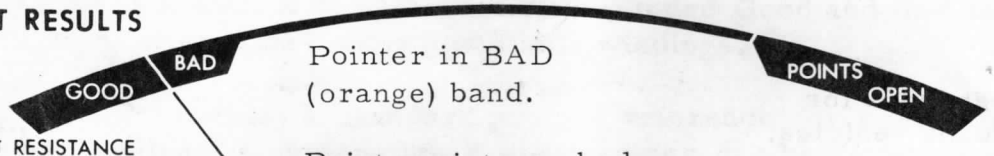


3. Turn the ignition switch on. If the meter pointer reads in the POINTS OPEN band, the ignition contact points are open. "Bump" the starter switch until meter pointer moves to the left. Points are now closed.

4. Observe reading on the Point Resistance scale.

5. At conclusion of test, reconnect coil wire to distributor cap.

TEST RESULTS



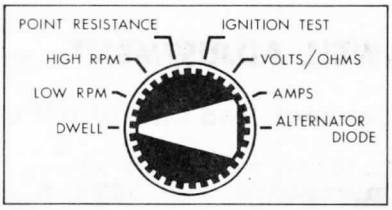
Pointer in GOOD (green) band.

Point resistance good

Pointer in BAD (orange) band.

Point resistance bad.
Check for:
1. Burned ignition points
2. Loose lead connections
3. Improper point installation
4. Misaligned points
5. Loose ground pigtail wire
6. Poorly grounded distributor

NOTE: New contact points should be cleaned before installation. Uncleaned points may have high resistance due to protective coating.



DWELL TEST

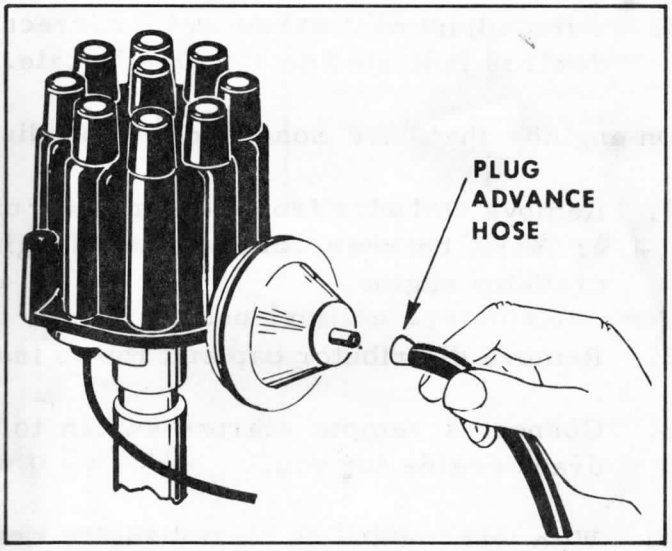
(Connect Red and Black clips and set Cylinders switch as shown on page 5.)

NOTE: This test does not apply to transistorized ignition systems (except those types using conventional contact points).

1. Rotate Function Selector switch to DWELL.

2. Disconnect and plug the vacuum advance hose(s) to the distributor, as on some distributors the dwell angle changes with the operation of the vacuum advance. Note: If engine is equipped with an advance/retard solenoid, disconnect solenoid wire at the carburetor end.

3. Start engine and operate at standard idle.



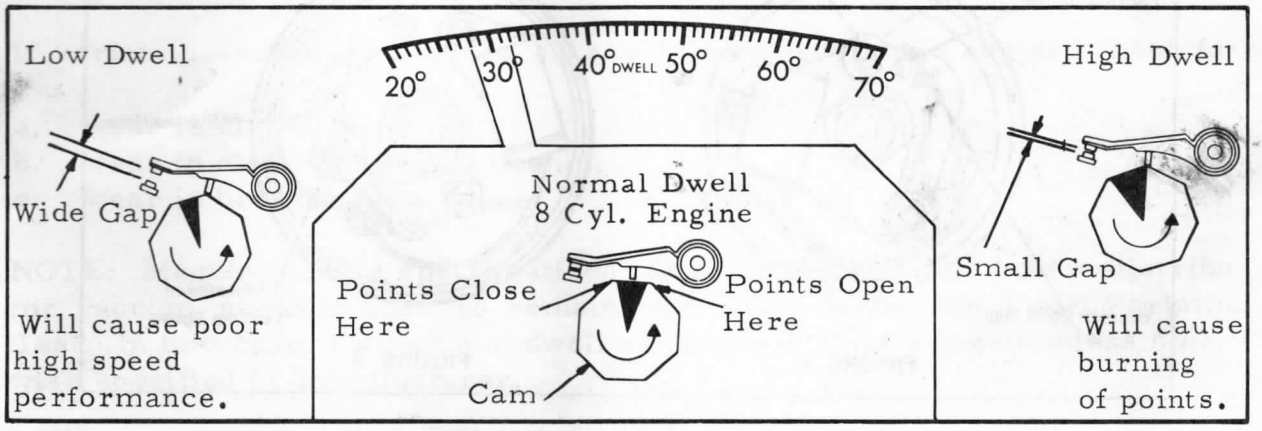
4. Observe Dwell scale. When testing 4, 6 or 8-cylinder engine, read Dwell scale directly. When testing smaller engines, set Cylinders switch as described under Hook-Up, page 5, and read dwell as follows:

   1 cylinder - reading x 4
   2 cylinders - reading x 2
   3 cylinders - reading x 2

TEST RESULTS

Dwell reading should meet the engine manufacturer's specifications.

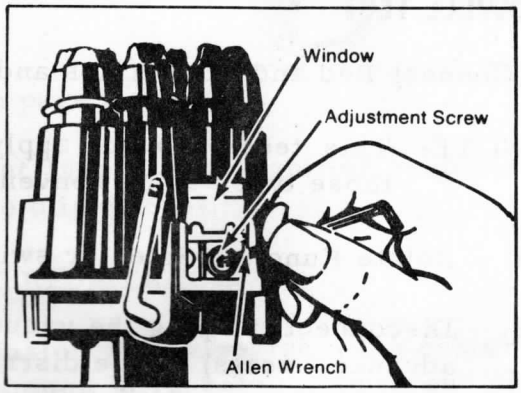
LOW -- Wide point spacing
NORMAL -- Correct point setting for most 8-cylinder engines
HIGH -- Close point spacing



DWELL ADJUSTMENT

(Connect Red and Black clips and set Cylinders switch as shown on page 5.)

On engines that have a sliding window in distributor cap, adjust dwell as follows:



1. Operate engine at standard idle.
2. Raise window and insert a 1/8-in. Allen wrench into adjustment screw.
3. Turn adjustment screw until correct dwell is indicated on the Dwell scale.

On engines that have non-window type distributors, adjust dwell as follows:

1. Remove coil wire from center tower of distributor cap and connect Jumper Wire between coil wire and engine ground to prevent arcing while cranking engine.
2. Remove distributor cap and rotor.
3. Connect a remote starter switch to test vehicle or have an assistant crank engine for you.
4. With ignition switch on and engine cranking, observe reading on the Dwell scale.
5. To adjust dwell, loosen locking screw slightly and adjust point gap by turning adjustment screw (Figure A) or by inserting a screwdriver in the slotted hole (Figure B) and turning the tool slightly left or right to obtain the specified gap. Tighten locking screw and recheck dwell while cranking engine. Repeat procedure if necessary.

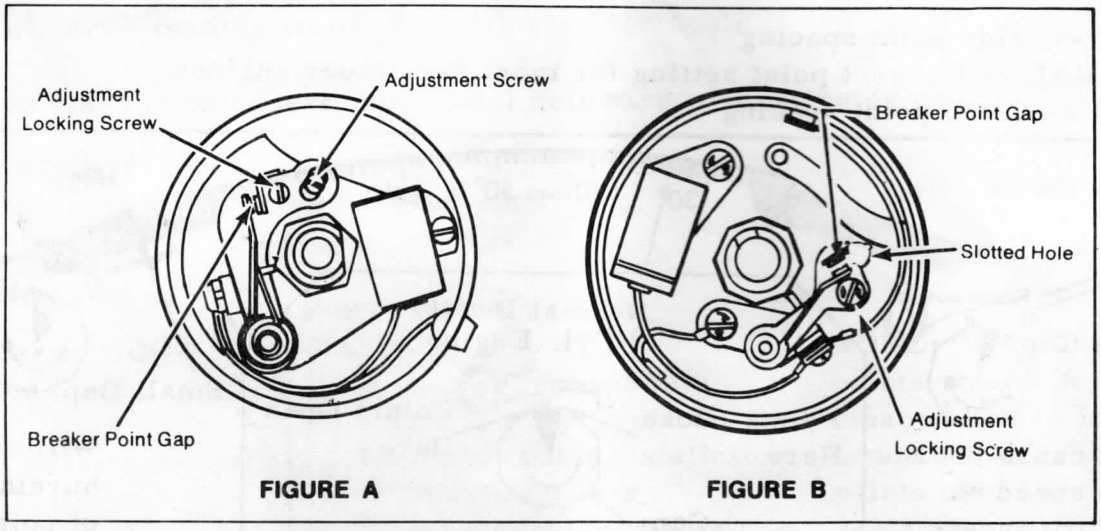
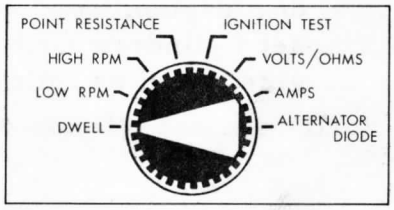


FIGURE A **FIGURE B**

6. Reassemble distributor and recheck dwell reading with engine operating at standard idle.

NOTE: It is important to recheck the ignition timing every time the dwell is adjusted. A one degree change in dwell causes a one degree change in timing.



DWELL VARIATION TEST

(Connect Red and Black clips and set Cylinders switch as shown on page 5.)

NOTE: This test does not apply to transistorized ignition systems (except those types using conventional contact points).

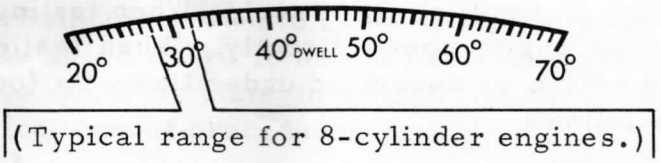
1. Rotate Function Selector switch to DWELL.

2. Disconnect vacuum advance hose(s) as described in Dwell Test.

3. Operate engine at standard idle. While observing Dwell scale for any change in reading, increase engine speed to approximately 1500 RPM and then return to idle.

4. Reconnect vacuum advance hose(s).

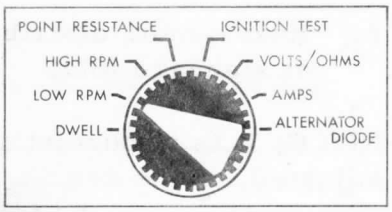
TEST RESULTS



If variation exceeds 3 degrees on any 4, 6 or 8-cylinder engine, check for:

a. wear in distributor shaft
b. wear in distributor shaft bushing
c. wear in breaker plate

NOTE: Manufacturer's specifications for some engines call for the distributor vacuum advance hose to remain connected during the Dwell Variation Test. In this case, a maximum dwell variation of 6° is allowed unless otherwise specified by manufacturer.



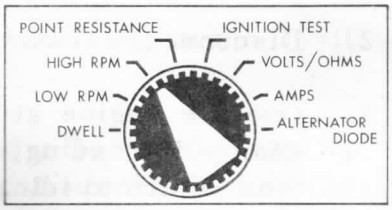
ENGINE SPEED-LOW RPM

(Connect Red and Black clips and set Cylinders switch as shown on page 5.)

1. Rotate Function Selector switch to LOW RPM.

2. Observe reading on the Low RPM scale. When testing a 4, 6 or 8-cylinder engine, read engine speed directly. When testing smaller engines, set Cylinders switch as described under Hook-Up (page 5) and read engine speed as follows:

1 cylinder -- reading x 4
2 cylinders -- reading x 2
3 cylinders -- reading x 2



ENGINE SPEED-HIGH RPM

(Connect Red and Black clips and set Cylinders switch as shown on page 5.)

1. Rotate Function Selector switch to HIGH RPM.

2. Observe reading on the High RPM scale. When testing a 4, 6 or 8-cylinder engine, read engine speed directly. When testing smaller engines, set Cylinders switch as described under Hook-Up (page 5) and read engine speed as follows:

1 cylinder -- reading x 4
2 cylinders -- reading x 2
3 cylinders -- reading x 2

The 1000-6000 RPM scale is used primarily for setting the engine at specified speeds to perform other tests. It can also be used for road testing purposes.

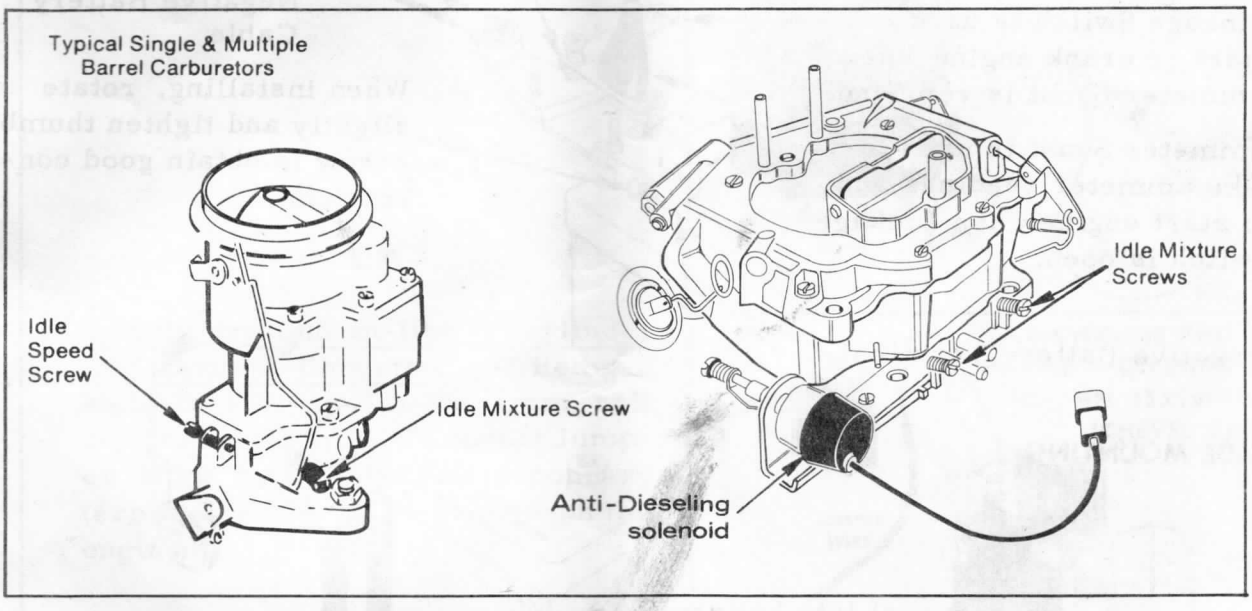
CARBURETOR ADJUSTMENTS

The AUTOMOTIVE ANALYZER can be used with manufacturers' specifications to adjust idle speed and mixture, as well as the fast idle cam, the curb idle solenoid and other carburetor components. However, many 1970 and later model cars have idle mixture screw limiter caps that prohibit or restrict carburetor adjustment. On vehicles so equipped, the carburetor should be adjusted according to the manufacturer's service manual procedures.

Carburetors without mixture screw limiter caps can be adjusted as follows:

1. Start engine and allow it to warm to normal operating temperature. Shut off engine.

2. Turn in idle mixture screw(s) until it/they are lightly seated. Back screw(s) out three full turns or until a stop is felt.



3. Start engine and let it idle for one minute.

4. Rotate Function Selector switch to LOW RPM. Observing 200-1000 RPM scale, adjust idle speed screw to obtain idle speed specified by manufacturer. (Refer to decal or plate in engine compartment, or set idle according to service manual procedures.)

5. On vehicles equipped with an air pump, disconnect either end of the air pump hose(s) leading to the air manifold check valve. Note that the engine speed drops. This lowered engine speed is the RPM that must be maintained during idle mixture adjustment.

6. Adjust idle mixture by turning idle mixture screw(s) in (or out) to obtain an increase in RPM. Readjust idle speed to correct RPM. Repeat these steps until no further increase in RPM is obtainable.

7. Reconnect air pump hose(s). Engine speed should return to manufacturer's specifications (step 4).

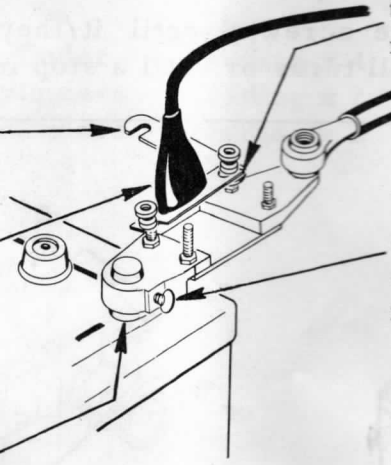
ELECTRICAL SYSTEM TESTING

HOOK-UP

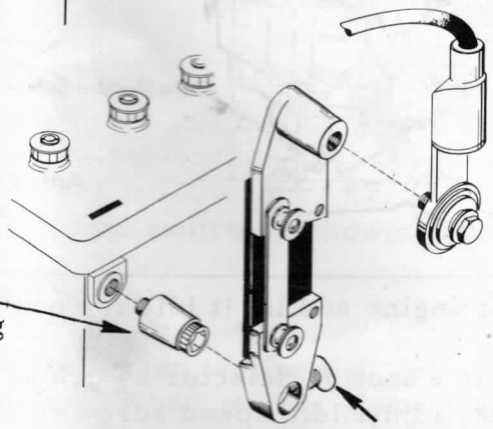
CAUTION: A charging battery generates explosive gas. Do not permit flame or spark to occur near battery. Safety goggles should be worn at all times while working around battery.

① Disconnect the negative (-) battery cable and install the Battery Post Adapter as shown below.

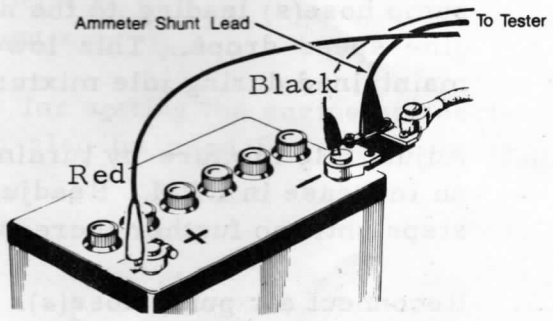
TOP MOUNTING


Connect Ammeter Shunt so that forked end is facing negative battery cable.
Negative Battery Cable
Linkage Switch is used to start or crank engine when Ammeter Shunt is removed.
When installing, rotate slightly and tighten thumbscrew to obtain good connection.
Ammeter Shunt is used to take ammeter readings and to start engine when Linkage Switch is open.
Negative Battery Terminal

SIDE MOUNTING


Screw post into battery terminal before installing Battery Post Adapter.
Tighten thumbscrew to obtain good connection.

② Connect Red clip to the positive (+) battery post and Black clip to the negative (-) battery post.



NOTE:

A. Linkage Switch must be in the open position when using Ammeter Shunt.

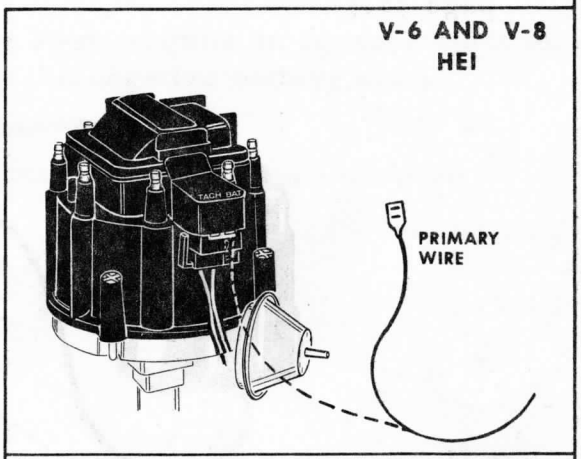
B. Never open both Linkage Switch and Ammeter Shunt when engine is running, as this may damage automobile electrical circuits.

—NOTE—

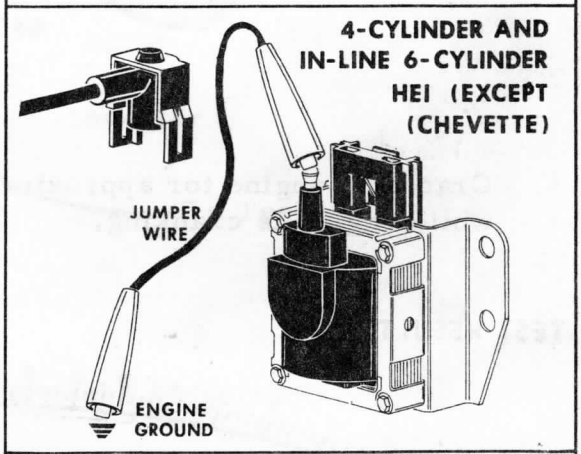
GENERAL MOTORS HIGH ENERGY IGNITION

When performing electrical system tests on General Motors vehicles equipped with High Energy Ignition (HEI), the engine can be prevented from starting as follows:

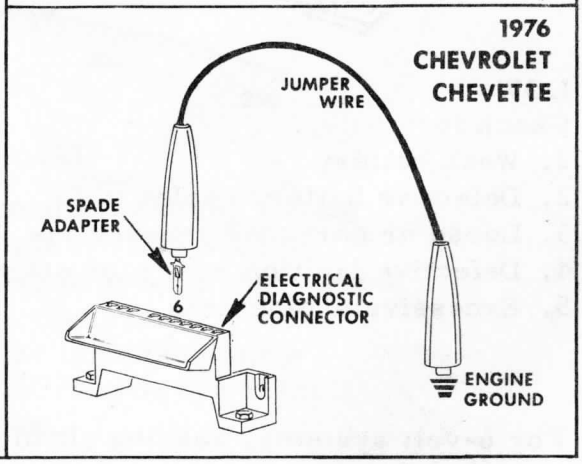
V-6 and V-8 HEI -- Disconnect primary wire from the BAT terminal on the distributor cap.

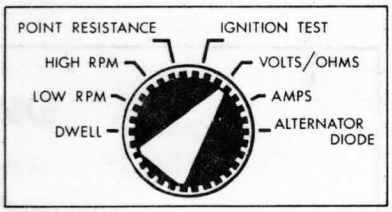


4 - cylinder and in-line 6 - cylinder HEI (except Chevette) -- Remove high - tension coil wire from coil secondary terminal. Connect Jumper Wire between coil secondary terminal and a good ground on the engine.



1976 Chevrolet Chevette -- Insert Spade Adapter in terminal No. 6 of Electrical Diagnostic Connector. Connect Jumper Wire between Spade Adapter and a good ground.



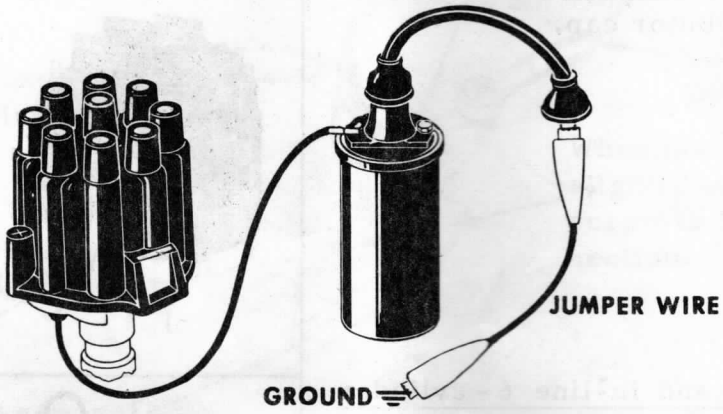


BATTERY TEST

(Connect Red and Black test clips as shown on page 12.)

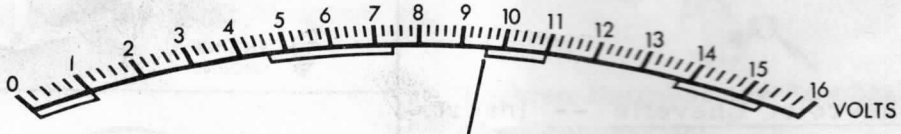
1. Rotate Function Selector switch to VOLTS/OHMS.

2. Remove coil wire from center tower of distributor cap. Connect Jumper Wire between open end of coil wire and a good ground to prevent engine from starting. (To disable General Motors High Energy Ignition, see page 13.)



3. Crank the engine for approximately 5 seconds. Observe the Volts scale while engine is cranking.

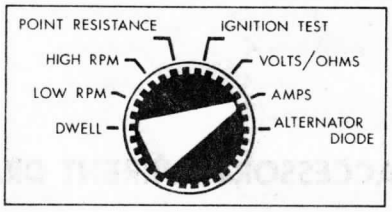
TEST RESULTS



LOW
Check for:
1. Weak battery
2. Defective battery cables
3. Loose or corroded connections
4. Defective ignition switch or starter
5. Excessive engine drag

GOOD
Battery and starter system functioning normally. Reading should be 9.6 volts or more for a 12-volt system.

For 6-volt systems, reading should always be 4.8 volts or higher.



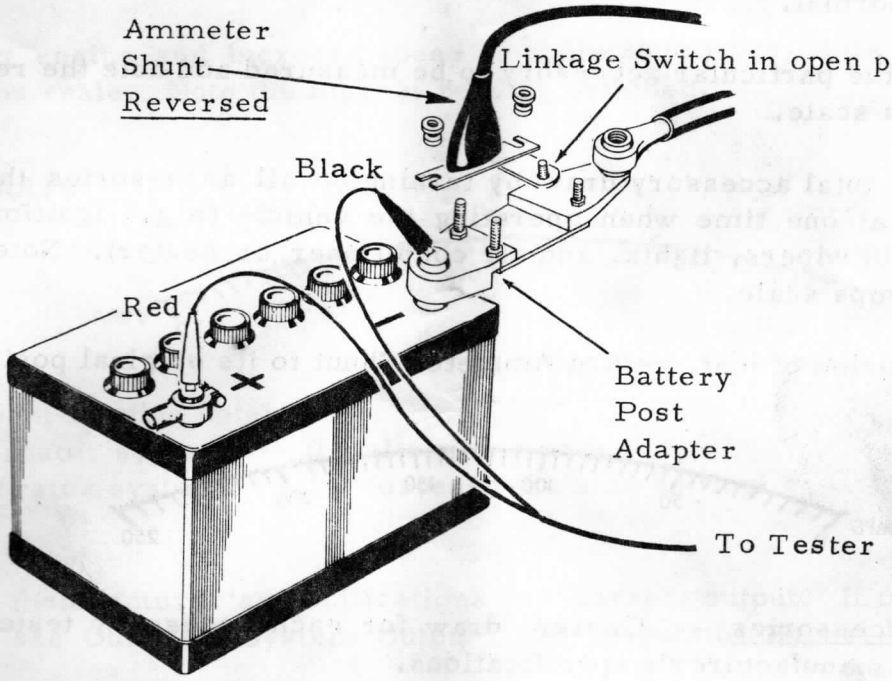
STARTER CURRENT DRAW TEST

(Connect Battery Post Adapter as shown on page 12. Red and Black test clips may be connected, but are not required for this test.)

1. Rotate Function Selector switch to AMPS.

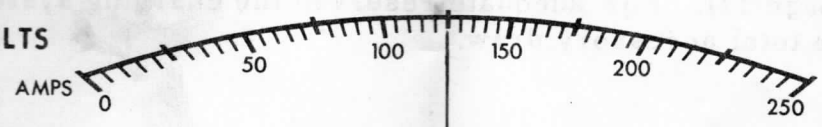
2. Remove coil wire from center tower of distributor cap and ground it with Jumper Wire as described in Battery Test. (To disable General Motors High Energy Ignition, see page 13.)

3. Connect Ammeter Shunt to the Battery Post Adapter in reverse (that is, with the forked end of the shunt next to the negative battery post).



4. While cranking engine, observe reading on the Amps scale.

TEST RESULTS

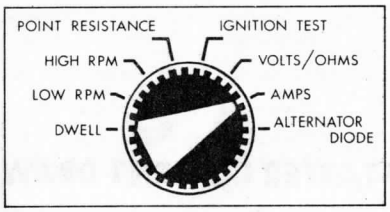


LOW

Very low current draw, often accompanied by slow cranking speed, indicates high resistance in the starter motor (providing external circuits are known to be good).

NORMAL

Normally, reading should be between 125 and 250 amps, depending on size and condition of engine. See engine manufacturer's specifications for exact values.



ACCESSORY CURRENT DRAW TEST

(Connect Battery Post Adapter as shown on page 12. Red and Black test clips may be connected, but are not required for this test.)

1. Rotate Function Selector switch to AMPS.

2. Connect the Ammeter Shunt in reverse, as described in the Starter Current Draw Test.

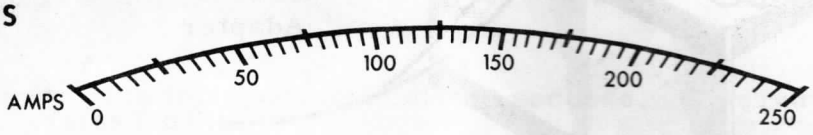
3. Starting with all accessories off, the meter should read zero. Any reading at this time indicates circuit leakage, which should be corrected. NOTE: An electric clock will indicate a slight drain in its wind up cycle. This is normal.

4. Turn on the particular accessory to be measured and note the reading on the Amps scale.

5. Measure total accessory draw by turning on all accessories that might be used at one time when operating the vehicle (e.g., ignition, radio, windshield wipers, lights, and air conditioner or heater). Note reading on the Amps scale.

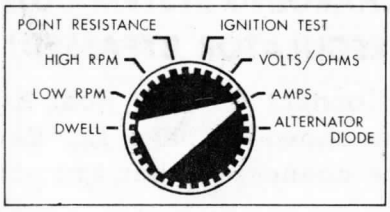
6. At conclusion of test, return Ammeter Shunt to its original position.

TEST RESULTS



Individual Accessories -- Current draw for each accessory tested should meet vehicle manufacturer's specifications.

All Accessories -- Compare total accessory current draw with charging system output (see page 17). For adequate reserve, the charging system output should exceed the total accessory draw.



CHARGING SYSTEM OUTPUT

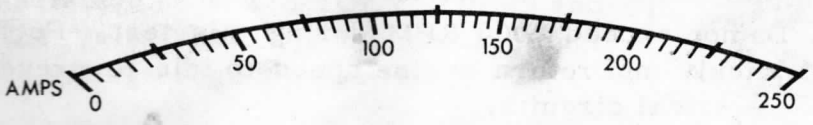
(Connect Battery Post Adapter and Ammeter Shunt as shown on page 12. Red and Black test clips may be connected, but are not required for this test.)

1. Remove coil wire from center tower of distributor cap and ground it with Jumper Wire as described in Battery Test. (To disable General Motors High Energy Ignition, see page 13.) Crank engine for 10-15 seconds to partially discharge the battery.

2. Reconnect coil wire to distributor. Rotate Function Selector switch to AMPS.

3. Start engine and increase speed to about 2000 RPM while observing the Amps scale. Note the highest reading obtained.

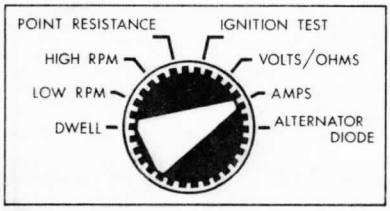
TEST RESULTS



The highest reading obtained is:
For alternator systems -- the alternator output
For generator systems -- the current regulator setting

Refer to manufacturer's specifications for correct output. If output is below normal, see Charging System Output Test (Regulator Bypassed) for further testing.

CHARGING SYSTEM OUTPUT TEST (REGULATOR BYPASSED)



(Connect Battery Post Adapter and Ammeter Shunt as shown on page 12. Red and Black test clips may be connected, but are not required for this test.)

NOTE: On alternators with built-in voltage regulator, perform this test according to manufacturer's instructions.

1. Remove coil wire from center tower of distributor cap and ground it with Jumper Wire as described in Battery Test. (To disable General Motors High Energy Ignition, see page 13.) Crank engine for 10-15 seconds to partially discharge the battery. Reconnect coil wire to distributor cap.

2. With the engine stopped, disconnect the field wire (or connector containing field wire) from the generator or alternator, and connect one end of Jumper Wire to the field terminal. (On Chrysler products with two field wires, disconnect the green wire.) Leave the other end of the Jumper Wire free. All accessories should be off.

3. Rotate Function Selector switch to AMPS.

4. Start the engine and set speed to approximately 1500 RPM.

CAUTION: A. Do not exceed 2000 RPM during this test. Perform the test quickly and return engine speed to idle to prevent damage to electrical circuits.

B. Keep hands and test leads well away from belts, fan and other moving engine parts.

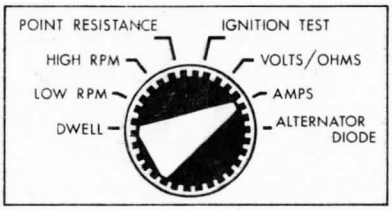
5. Observe Amps scale. Meter reading should be near zero at this time.

6. While observing the Amps scale, momentarily touch the free end of the Jumper Wire, in turn, to the output ("BAT") terminal of the alternator or generator, and to ground on the engine.

7. At conclusion of test, reconnect field wire to the generator or alternator.

TEST RESULTS

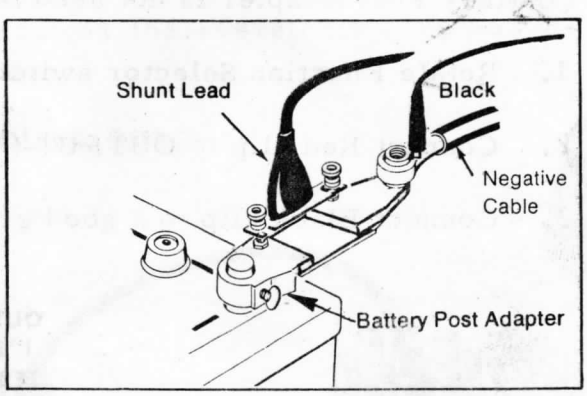
When the Jumper Wire is connected either to the output ("BAT") terminal or to ground, the meter should show the full rated output of the generator or alternator. If proper output cannot be obtained from either connection, then the alternator or generator is faulty.



VOLTAGE REGULATOR TEST

(Connect Red test clip, Battery Post Adapter and Ammeter Shunt as shown on page 12.)

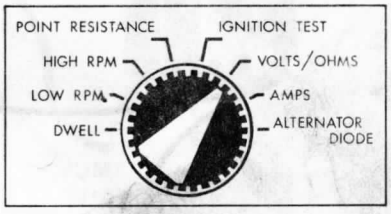
1. Connect Black test clip to negative battery cable as shown at right.



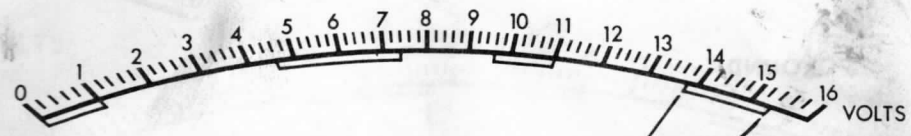
2. Rotate Function Selector switch to AMPS.

3. Start engine and operate at about 1500 RPM until charging current drops below 10 amps, as indicated on the Amps scale. (If current does not drop, battery probably needs recharging.)

4. After charge rate has dropped off, rotate Function Selector switch to VOLTS/OHMS and observe the Volts scale for highest reading. This is the voltage regulator setting.



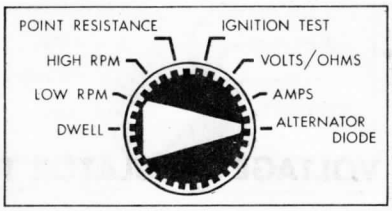
TEST RESULTS



VOLTAGE LOW
Check for:
1. Loose fan belt
2. Defective voltage regulator
3. High circuit resistance
4. Defective diodes
5. Open field circuit
6. Defective alternator
7. Voltage regulator setting too low

VOLTAGE NORMAL
Voltage regulator OK -- 13.8 to 15.4 volts (7.0 to 7.7 volts for 6-volt system)

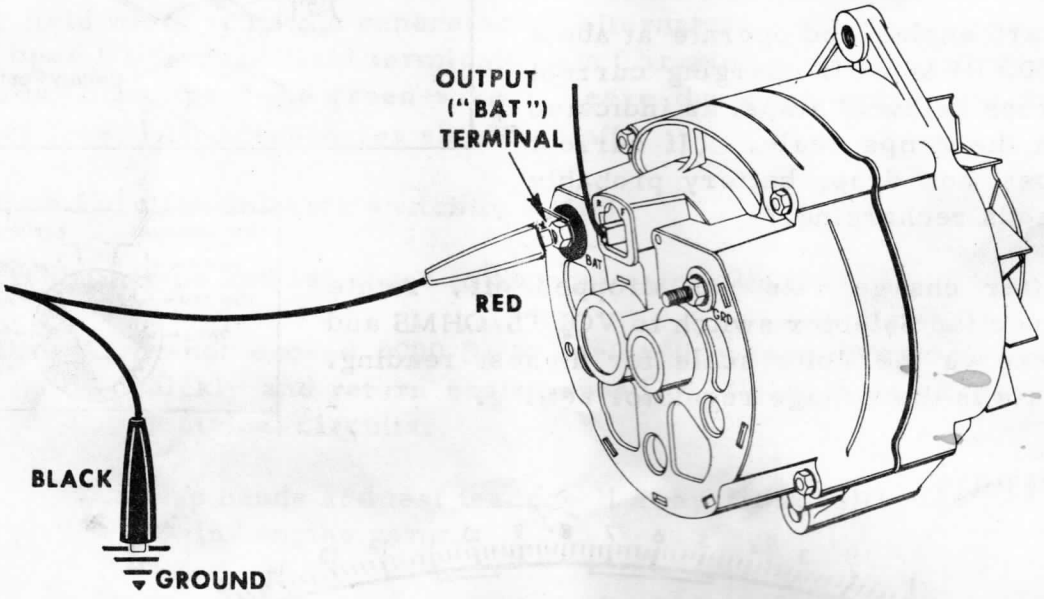
VOLTAGE HIGH
Check for:
1. Defective voltage regulator
2. High resistance in voltage regulator ground circuit
3. Voltage regulator setting too high



ALTERNATOR DIODE TEST

(Battery Post Adapter is not used for this test.)

1. Rotate Function Selector switch to ALTERNATOR DIODE.
2. Connect Red clip to OUTPUT ("BAT") terminal of the alternator.
3. Connect Black clip to a good ground on the engine.

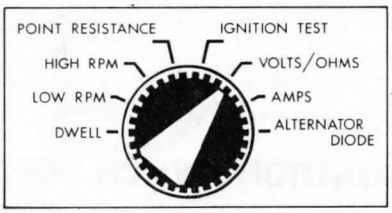


4. Turn on test vehicle headlights. Start engine and operate at fast idle. NOTE: Keep hands and test leads well away from belts, fan and other moving engine parts.
5. Observe reading on the Alternator Diode scale.

TEST RESULTS

GOOD
Reading in green GOOD band indicates all alternator diodes and stator windings are good. Alternator is operating satisfactorily.

BAD
Reading in orange BAD band indicates one or more diodes or stator windings are open or shorted. Alternator is defective and should be serviced.



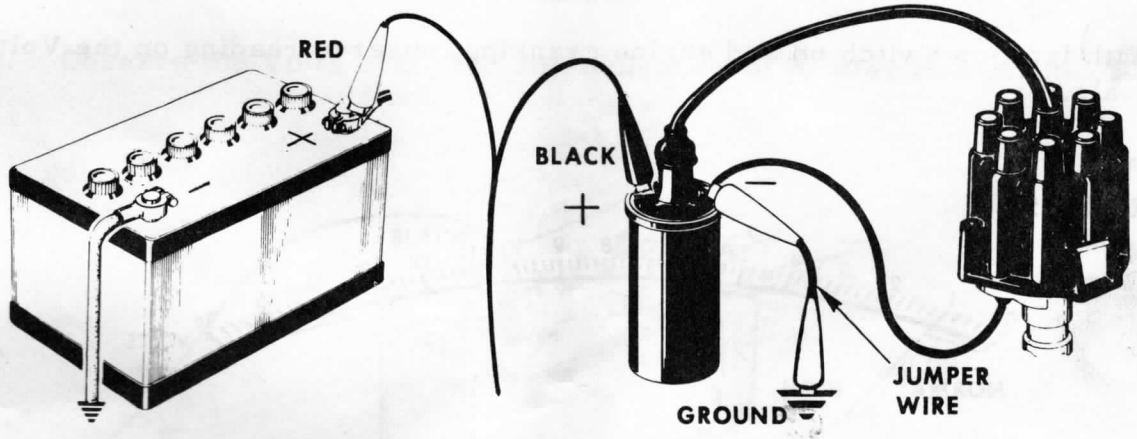
PRIMARY IGNITION VOLTAGE TEST

(Battery Post Adapter is not used for this test.)

NOTE: This test does not apply to the General Motors High Energy Ignition or the American Motors BID ignition, as these systems have no ballast resistor in the primary circuit.

1. Rotate Function Selector switch to VOLTS/OHMS.

2. Connect Jumper Wire and Red and Black test clips as illustrated below.



3. Turn ignition switch on and observe reading on the Volts scale.

TEST RESULTS

LOW

If reading is below 4.6 volts, check for defective or incorrect ballast resistor or resistance wire in primary circuit. If reading is "0" or near "0", the primary resistor is shorted (or is located within the coil.

NORMAL

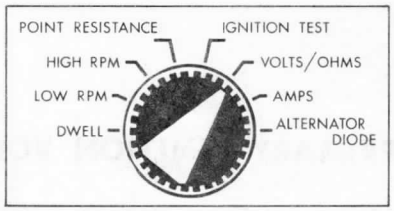
Reading should be between 4.6 and 7.4 volts.

HIGH

A reading above 7.4 volts indicates high resistance. Check for:

1. Defective ballast resistor or resistance wire
2. Loose or corroded connections
3. Defective ignition switch
4. Defective neutral safety switch

NOTE: On a 6-volt system, a reading above 1 volt indicates high circuit resistance.



IGNITION SWITCH VOLTAGE TEST

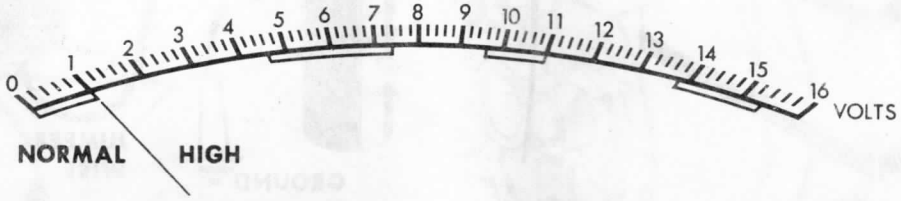
(Battery Post Adapter is not used for this test.)

1. Rotate Function Selector switch to VOLTS/OHMS.

2. Connect Jumper Wire and Red and Black test clips as shown in Primary Ignition Voltage Test. (To disable General Motors High Energy Ignition, see page 13. On V-6 and V-8 High Energy Ignition, connect Black clip to distributor BAT terminal, turn ignition on, and observe Volts scale.)

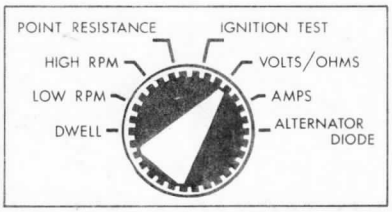
3. With ignition switch on and engine cranking, observe reading on the Volts scale.

TEST RESULTS



NORMAL -- A reading below 1 volt indicates that the ignition is properly bypassing the primary resistor during cranking. NOTE: A 6-volt system is also within this specification.

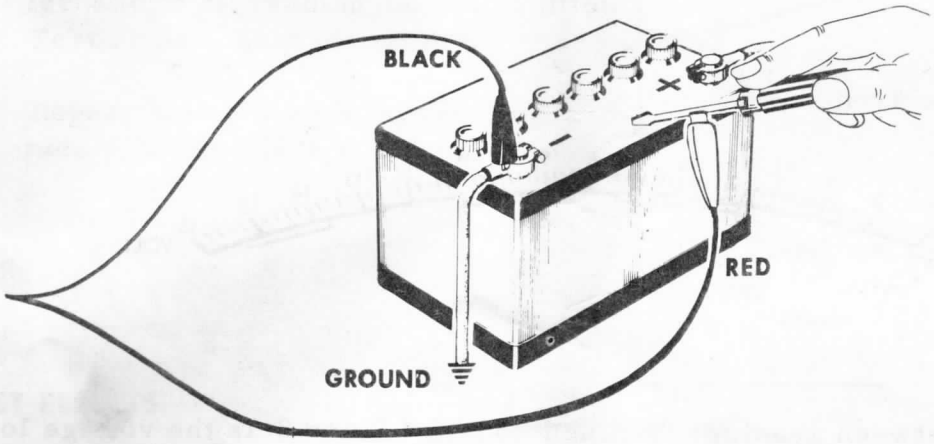
HIGH -- A reading above 1 volt indicates excessive resistance or an open in the bypass circuit. Check for loose or corroded connections. NOTE: A few engines have a ballast resistance wire that is operational during both cranking and running. In this case, a reading above 1 volt would be normal.



BATTERY EXTERNAL LEAKAGE TEST

(Battery Post Adapter is not used for this test.)

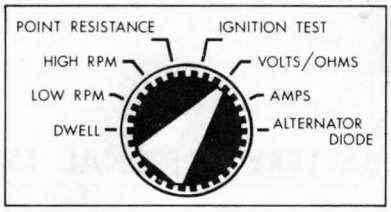
1. Rotate Function Selector switch to VOLTS/OHMS.
2. Connect Black test clip to the grounded post of the battery.
3. Touch Red test clip along the top of the cell covers and around the case of the battery as illustrated below.
4. Observe the Volts scale for any indication of pointer movement.



TEST RESULTS

No pointer movement indicates a clean battery with no external leakage.

Any movement of the meter pointer indicates acid or some conducting material on the battery case. Clean battery and hold down clamps with baking soda and water.



VOLTAGE LOSS TEST

(Battery Post Adapter is not used for this test.)

1. Rotate Function Selector switch to VOLTS/OHMS.

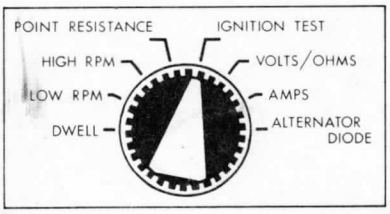
2. With current flowing, connect the Red and Black test clips across the part of the circuit to be tested and note reading on the Volts scale. If meter reads backwards, reverse Red and Black clips.

3. Connect Red clip to positive battery post and Black clip to negative battery post. (Reverse test clips for positive ground vehicles.) Note reading on the Volts scale.

TEST RESULTS

The difference between readings obtained in steps 2 and 3 is the voltage loss in the circuit being tested. Refer to vehicle manufacturer's specifications for allowable loss in particular circuits.

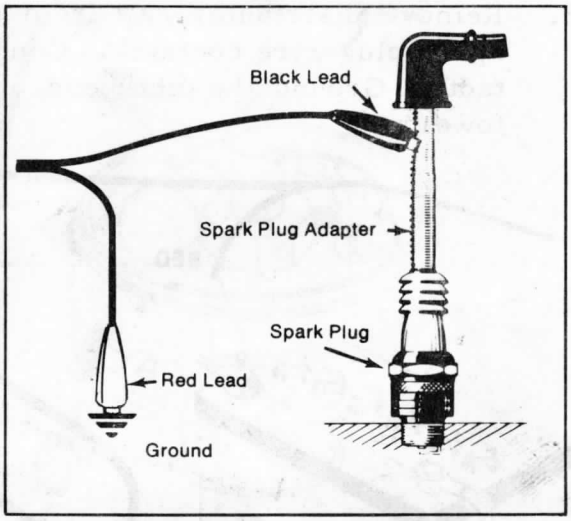
Any automotive electrical circuit can be checked for voltage loss in this manner.



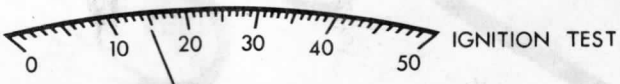
IGNITION TEST

(Battery Post Adapter is not used for this test.)

1. Rotate Function Selector switch to IGNITION TEST.
2. Install Domestic or Foreign Spark Plug Adapter between a spark plug and spark plug wire.
3. Connect Red clip to ground on engine (regardless of vehicle ground polarity).
4. Operate engine at about 1500 RPM.
5. Touch Black clip to spark plug adapter and note reading on the Ignition Test scale. Shut off engine.
6. Repeat test for each spark plug and note relative scale readings.



TEST RESULTS



LOW

Bad Readings on All Cylinders.
Check for:

1. Corrosion or open in ignition coil or coil wire
2. Corrosion in coil tower of distributor cap
3. Burned rotor tip or carbon button inside distributor cap

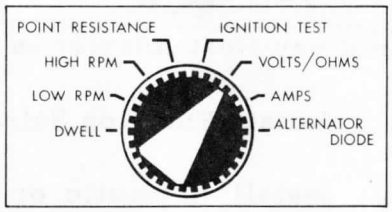
Bad Readings on One or More, But Not All, Cylinders.
Check for:

1. Corroded or open spark plug cable
2. Corrosion of distributor cap towers or terminal inserts
3. Defective resistance in resistor spark plugs

NORMAL

Normally, the readings should be 15 or more and about equal for all spark plugs.

OHMMETER TESTS

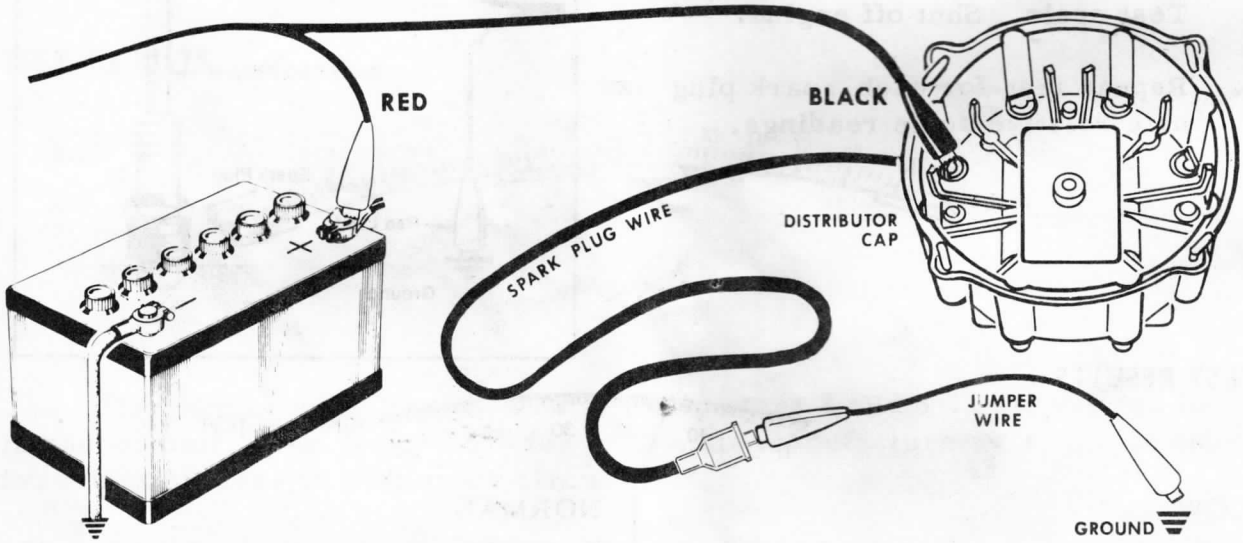


IGNITION WIRE TEST

1. Rotate Function Selector switch to VOLTS/OHMS.

2. Connect Red test clip to positive (+) battery terminal.

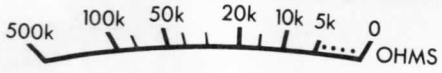
3. Remove distributor cap from distributor to provide access to internal spark plug wire contacts. Connect Black test clip to one of the cap contacts. Ground the other end of the spark plug wire attached to that cap tower.



4. Observe reading on the Ohms scale. Repeat test for each spark plug wire.

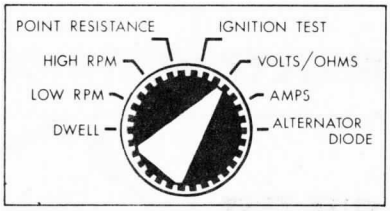
5. Test high-tension wire between coil and distributor cap by removing the wire and connecting it between the Black clip and ground.

TEST RESULTS



Compare ohmmeter reading with vehicle manufacturer's specifications. If reading is high, check for:

1. Faulty spark plug wire
2. Corrosion in distributor cap tower

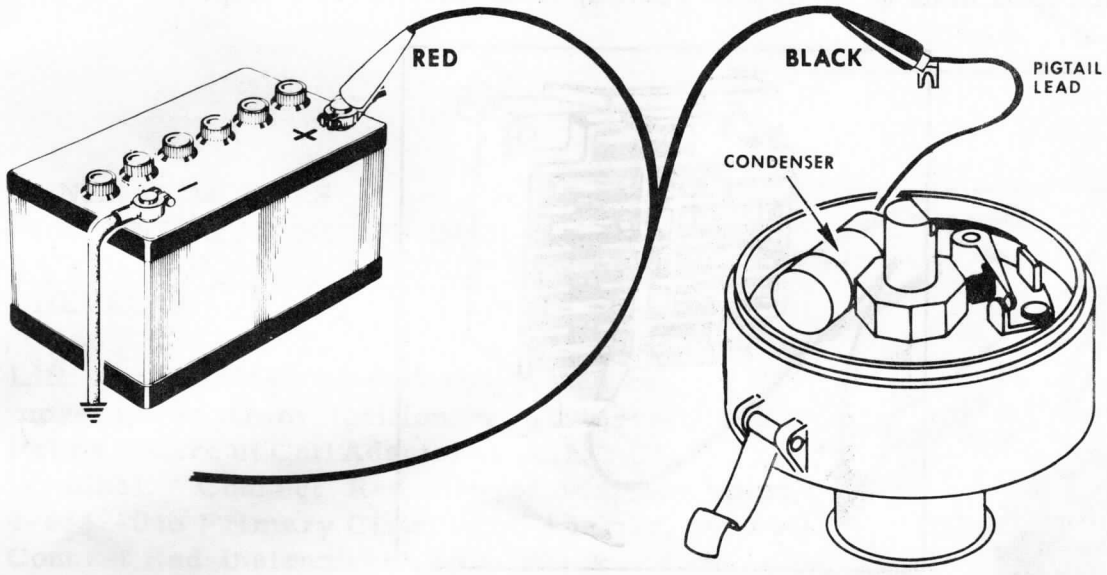


CONDENSER TEST

1. Rotate Function Selector switch to VOLTS/OHMS.

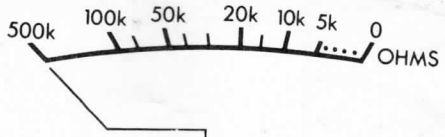
2. Connect Red test clip to positive (+) battery terminal.

3. Disconnect condenser pigtail lead from ignition contact points. Connect Black test clip to the disconnected pigtail lead.



4. Observe reading on the Ohms scale.

TEST RESULTS

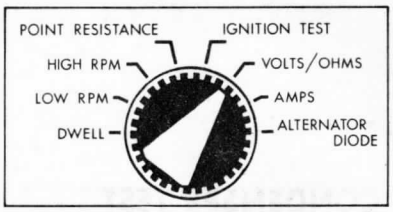


CONDENSER OK

A reading on extreme left edge of Ohms scale indicates condenser has no leakage.

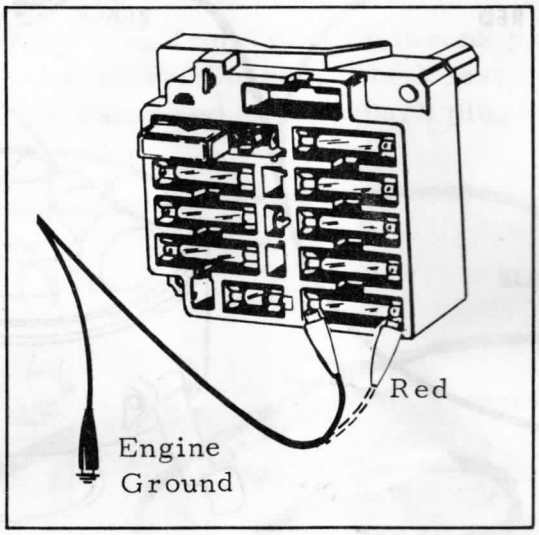
CONDENSER LEAKAGE

Any reading to the right indicates condenser is leaky and should be replaced.



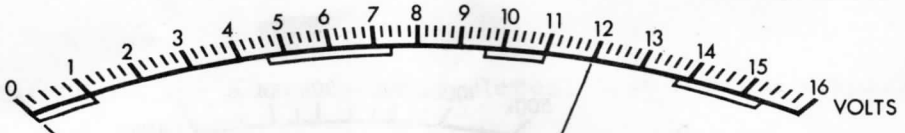
FUSE TEST

1. Rotate Function Selector switch to VOLTS/OHMS.
2. Turn ignition switch on.
3. Connect Black test clip to a good ground on the engine.
4. Touch both ends of fuse to be tested, in turn, with Red clip.



5. Observe reading on the Volts scale.

TEST RESULTS



OPEN CIRCUIT

Zero volts on both sides of fuse indicates an open circuit between the battery and fuse.

DEFECTIVE FUSE

Battery voltage on one side of fuse and zero on the other side indicates an open (defective) fuse.

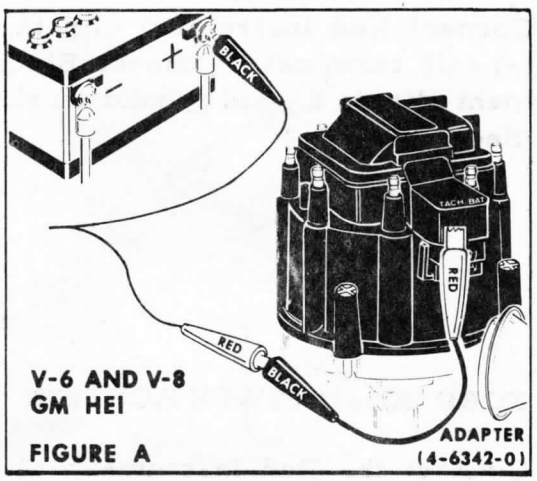
GOOD FUSE

A reading of battery voltage on both sides of fuse indicates the fuse is good.

TACHOMETER CONNECTIONS—
TRANSISTORIZED IGNITION SYSTEMS

GENERAL MOTORS
HIGH ENERGY IGNITION (HEI) --
V-6 AND V-8

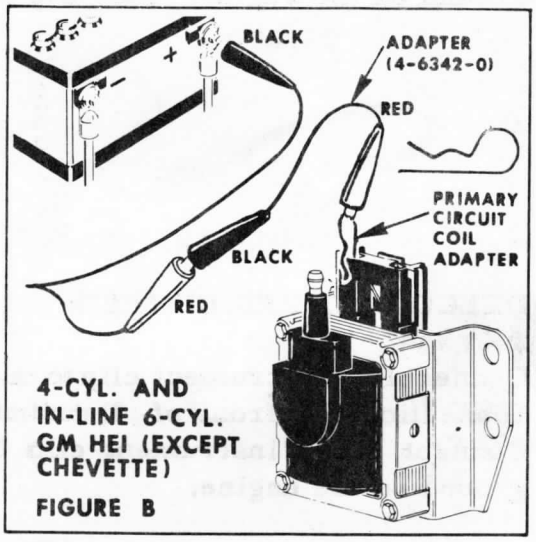
Connect Red clip of Adapter 4-6342-0 to distributor TACH terminal. Connect Red instrument clip to Black end of Adapter 4-6342-0. Connect Black instrument clip to positive (+) battery terminal. (See Figure A.)



V-6 AND V-8
GM HEI
FIGURE A

GENERAL MOTORS
HIGH ENERGY IGNITION (HEI) --
4 CYL. AND IN-LINE 6 CYL. (EXCEPT CHEVETTE)

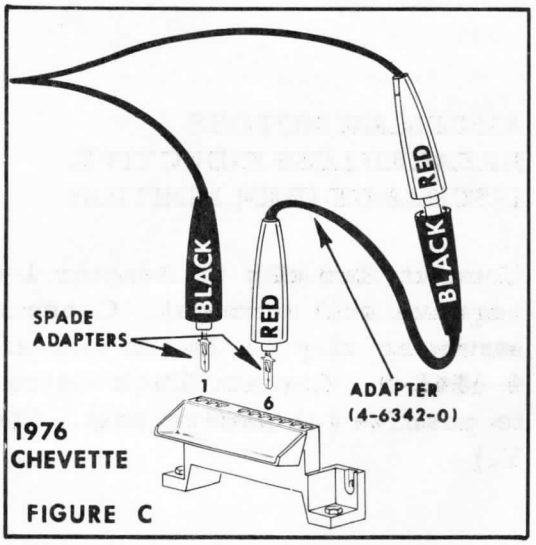
Lift tabs at sides of coil cover, and remove cover from ignition coil. Insert Primary Circuit Coil Adapter in coil TACH terminal. Connect Red clip of Adapter 4-6342-0 to Primary Circuit Coil Adapter. Connect Red instrument clip to Black end of Adapter 4-6342-0. Connect Black instrument clip to positive (+) battery post. (See Figure B.)



4-CYL. AND
IN-LINE 6-CYL.
GM HEI (EXCEPT
CHEVETTE)
FIGURE B

GENERAL MOTORS
HIGH ENERGY IGNITION (HEI) --
1976 CHEVROLET CHEVETTE

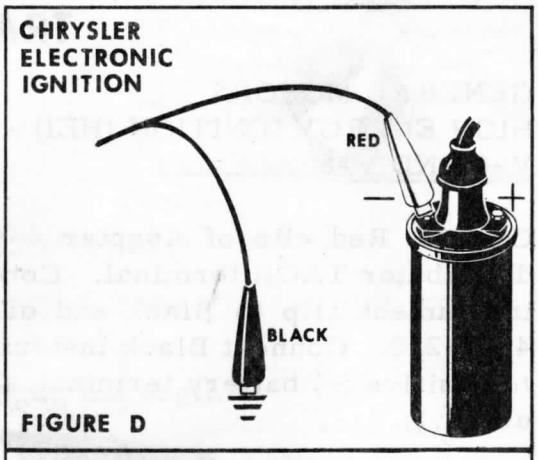
Slide Spade Adapters into Electrical Diagnostic Connector terminals No. 1 and No. 6. Connect Red clip of Adapter 4-6342-0 to terminal No. 6. Connect Red instrument clip to Black end of Adapter 4-6342-0. Connect Black instrument clip to terminal No. 1. (See Figure C.)



1976
CHEVETTE
FIGURE C

CHRYSLER ELECTRONIC IGNITION

Connect Red instrument clip to negative (-) coil terminal. Connect Black instrument clip to a good ground on the engine. (See Figure D.)

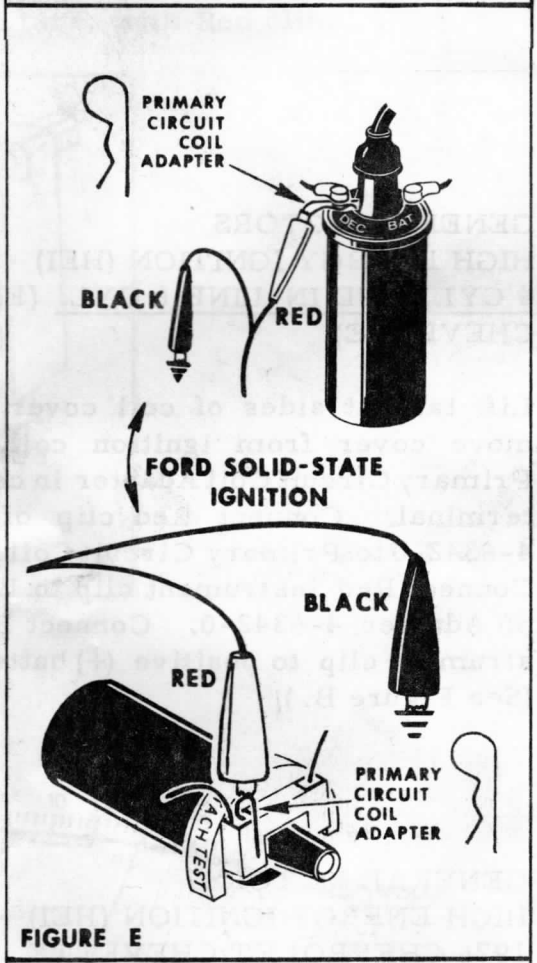


FORD SOLID-STATE IGNITION

Connect the Red instrument clip to coil terminal marked DEC or TACH TEST. Connect Black instrument clip to a good ground on the engine. (See Figure E.)

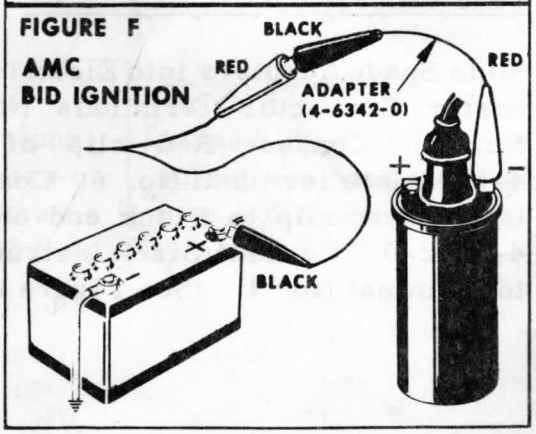
DELCO UNITIZED IGNITION

Connect Red instrument clip to tachometer connection on front of distributor cap. Connect Black instrument clip to a good ground on the engine.

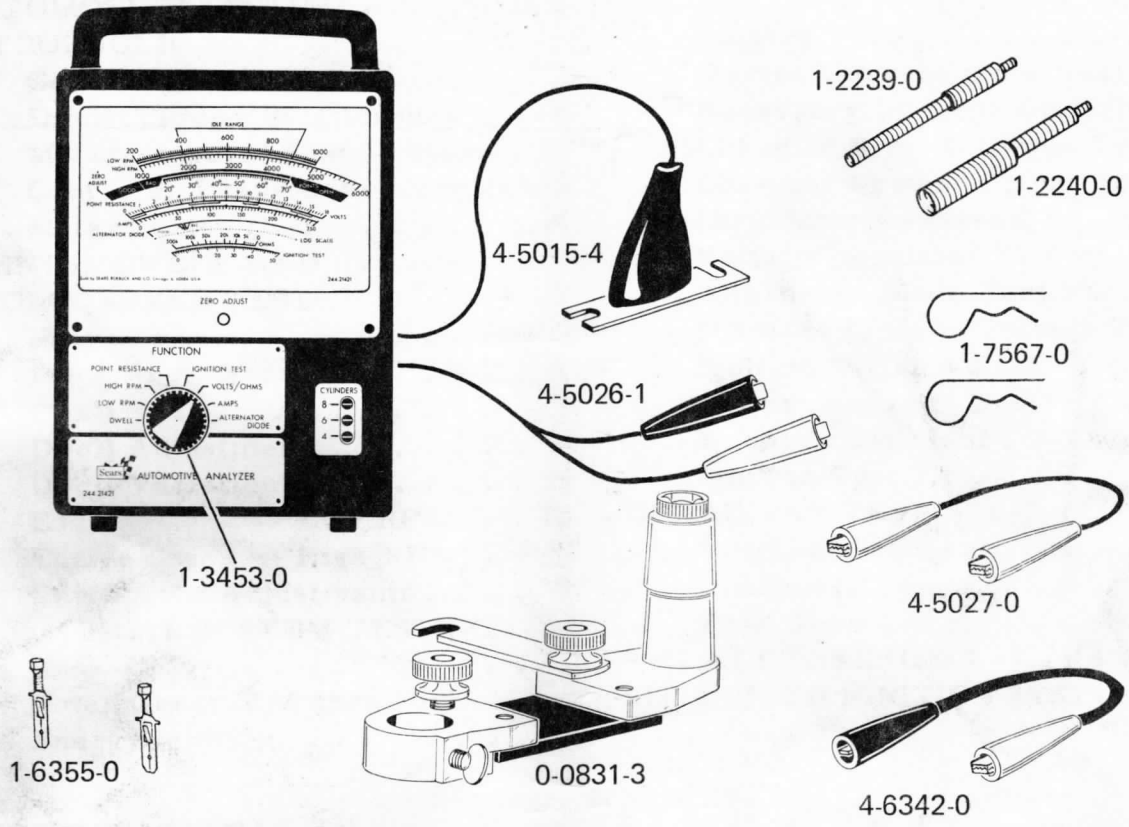


AMERICAN MOTORS BREAKERLESS INDUCTIVE DISCHARGE (BID) IGNITION

Connect Red clip of Adapter 4-6342-0 to negative coil terminal. Connect Red instrument clip to Black end of Adapter 4-6342-0. Connect Black instrument clip to positive (+) battery post. (See Figure F.)



REPAIR PARTS



PART DESCRIPTION	PART NO.
Battery Post Adapter	0-0831-3
Foreign Car Spark Plug Adapter	1-2239-0
Domestic Car Spark Plug Adapter	1-2240-0
Rotary Switch Knob	1-3453-0
Spade Terminals (2)	1-6355-0
Ford Coil Adapters (2)	1-7567-0
Mazda Instruction Sheet	3-1054-6
Ammeter Shunt Assembly w/BPA (Neg.), 5 feet	4-5015-4
2/C Lead Wire Assembly, 5 feet	4-5026-1
Jumper Wire Assembly	4-5027-0
Delco Unitized HEI Adapter	4-6342-0

Sears

owner's manual

AUTOMOTIVE ANALYZER

MODEL NO.
244.21421

The Model Number can be found on the face of the instrument. Always mention the Model Number when requesting service for your AUTOMOTIVE ANALYZER.

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